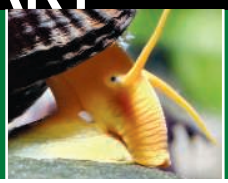
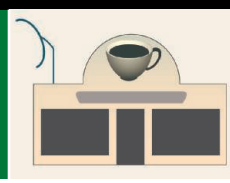
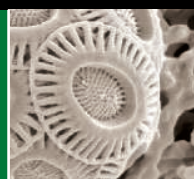
Snails, clams, squids, etc. 1014



Hows and whys of wireless communications 1018



Effects of ocean acidification 1020



LETTERS | BOOKS | POLICY FORUM | EDUCATION FORUM | PERSPECTIVES

LETTERS

edited by Jennifer Sills

Free Access to Landsat Imagery

Free image. This Landsat 5 image of the southeastern corner of the Black Sea is part of the general U.S. archive that will be accessible for free under the new USGS policy.

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WE ARE ENTERING A NEW ERA IN THE LANDSAT Program, the oldest and most venerable of our Earth-observing satellite programs. With little fanfare, the U.S. Geological Survey (USGS) has begun providing imagery for free over the Internet. Throughout the history of the Landsat Program, the cost and access to imagery has always limited our ability to study our planet and the way it is changing. Beginning with a pilot program to provide "Web-enabled" access to Landsat 7 images of the United States that were collected between 2003 and this year, the USGS now plans to provide top-quality image products for free upon request for the entire U.S. archive, including over 2 million images back to Landsat 1 (1972) [for details and schedules, see (*1*)]. The release by NASA and the USGS in January 2008 of a new Landsat Data Distribution Policy (*2*) was a key step to this goal. Free imagery will enable reconstruction of the history of Earth's surface back to 1972, chronicling both anthropogenic and natural changes during a time when our population doubled and the impacts of climate change became noticeable.

THE LANDSAT SCIENCE TEAM: CURTIS E. WOODCOCK,[1]* RICHARD ALLEN,[2] MARTHA ANDERSON,[3] ALAN BELWARD,[4] ROBERT BINDSCHADLER,[5] WARREN COHEN,[6] FENG GAO,[5] SAMUEL N. GOWARD,[7] DENNIS HELDER,[8] EILEEN HELMER,[9] RAMA NEMANI,[10] LAZAROS OREOPOULOS,[5] JOHN SCHOTT,[11] PRASAD S. THENKABAIL,[12] ERIC F. VERMOTE,[13] JAMES VOGELMANN,[14] MICHAEL A. WULDER,[15] RANDOLPH WYNNE[16]

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1. USGS Technical Announcement (http://landsat.usgs.gov/images/squares/USGS_Landsat_Imagery_Release.pdf).
2. Landsat Missions (http://ldcm.usgs.gov/pdf/Landsat_Data_Policy.pdf).

Why Rowe-Clark Doesn't Teach by the Book

WE ARE WRITING ON BEHALF OF THE 150 students attending Rowe-Clark Math and Science Academy, The Exelon Campus of Noble Street Charter School, and all of their teachers. *Science* reporter J. Mervis visited our campus for several hours this fall to observe our science and math classes, learn about our school, and interview students and teachers in preparation for the News Focus story "A new bottom line for school science" (22 February, p. 1030).

Rowe-Clark Math and Science Academy is an exemplary school, showcasing innovative, engaging science and math teaching and learning, as well as a model partnership between a school and a business. We thank Mervis for his attention to our school and the work we are doing with Exelon.

However, we feel that Mervis did a disservice to *Science* readers, as well as to Rowe-Clark students, teachers, and parents, due to a substantial—and even offensive—error in his reporting.

Mervis reported that freshmen taking physics at Rowe-Clark do not use a textbook. This is accurate. What is blatantly inaccurate is the reason Mervis cites: "because so many of them wouldn't be able to read it." V. Galarza explained clearly to Mervis her approach to teaching physics, and Mervis observed this during a 2-hour visit to our physics classroom. Using the modeling technique, Galarza guides students through hands-on experiments in which they collect data and, from that data, derive the laws of physics. Students remember what they learn because they have discovered it for themselves, not read it in a textbook. Many of our students are admittedly behind others at their grade level, but they are able readers who use textbooks in classes where that is deemed by the teacher to be the best tool for learning. In physics, active experiments make for more powerful and lasting learning than textbooks, and the modeling technique is an innovation

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in science education that is becoming increasingly widespread. It is a student-centered instructional strategy through which students participate in active scientific inquiry, discourse, and evaluation of evidence.

RACHEL KRAMER AND VANESSA GALARZA

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Science Education: Should Facts Come First?

IN THEIR EDUCATION FORUM "APPLICATION of Bloom's taxonomy debunks the 'MCAT myth'" (25 January, p. 414), A. Y. Zheng *et al*. suggest using Bloom's taxonomy as a tool for assessment of lower- and higher-level thinking. We think that Bloom's taxonomy should be considered more carefully before it is applied to the assessment and reform of undergraduate courses.

Bloom's taxonomy demonstrates a progressive sequence in human cognition, from simple (lower) to complex (higher) thought processes. However, it does not account for one important factor: a temporal or chronological sequence. At different stages of the whole educational process, instructional purposes are different. Assessments should reflect such purposes. Time-consuming lower-level fact instruction at earlier stages will contribute to and guarantee higher-level thinking. Without assessment of lower-level thinking (that is, the students' knowledge base and comprehension) at students' earlier stages, instructors may not know whether students are well equipped to advance to concepts that require higher-level thinking and how far the students could go.

All of the sources used by Zheng *et al*. were admission tests or first-year tests. The goal of this kind of test is to identify gaps in a student's mastery of basic facts, and higher-level questions are less effective in meeting this goal. It may be unrealistic and dangerous in assessment to jump to a greater proportion of higher-level thinking at the cost of possible ignorance of students' mastery of basic facts.

SHESEN GUO

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Response

GUO IS CORRECT IN POINTING OUT THAT THE explicitly hierarchical level of Bloom's taxonomy implies a chronological sequence in instruction (*1*, *2*). The literature does not, however, support the claim that factual recall should be the primary focus of early courses in a curriculum and that higher-order thinking should be reserved for later courses. Most educators believe that students should be working at higher levels in Bloom's hierarchy as often as possible. An author on both the original and revised Bloom's taxonomy (*1*, *2*) writes that educational objectives above the Factual Knowledge level "are usually considered the most important goals in education" [page 213 in (*3*)], including primary and secondary education. The recent revision of Bloom's taxonomy introduces a two-dimensional framework designed to assess how well the educational objectives from any course fulfill all elements in Bloom's framework (*2*, *3*).

In addition, we are not aware of data supporting Guo's assertion that "[t]ime-consuming lower-level fact instruction at earlier stages will … guarantee higher-level thinking." In our experience, an overemphasis on lower-order thinking at early stages of instruction impedes progress in later courses that also demand higher-order thinking. Problems arise because students have been trained to associate memorization with academic success.

Guo's letter reflects a view held by a substantial proportion of instructors that introductory science courses should focus primarily or even exclusively on factual content. The data in our Education Forum (25 January, p. 414) indicated that biology students who intend to pursue medical or graduate school are poorly served by such courses because the exams required for admission emphasize questions above the bottom rung on Bloom's taxonomy.

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1. B. S. Bloom, Ed., *Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I: Cognitive Domain* (David McKay, New York, 1956).
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Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 3 months or issues of general interest. They can be submitted through the Web (www.submit2science.org) or by regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

A Victory for PETA

AFTER 2 YEARS OF LOBBYING BY PEOPLE FOR the Ethical Treatment of Animals (PETA), CareerBuilder has stopped its chimpanzee advertisement campaign. On 23 January 2007, PETA announced online that CareerBuilder had agreed to stop this series of advertisements; however, CareerBuilder did not sign a pledge to never use great apes in its ads again (*1*). Both AAAS (*2*) and CareerBuilder have now made the right move.

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1. M. McGraw, "CareerBuilder retires chimpanzee ads following two-year PETA campaign" (23 January 2007); www.nomoremonkeybusiness.com/NewsItem1.asp?id=9447.
2. S. R. Ross *et al*., *Science* **319**, 1487 (2008).

TECHNICAL COMMENT ABSTRACTS

Comment on "Brain IRS2 Signaling Coordinates Life Span and Nutrient Homeostasis"

Colin Selman, Steven Lingard, David Gems, Linda Partridge, Dominic J. Withers

Taguchi *et al*. (Reports, 20 July 2007, p. 369) reported that mice heterozygote for a null mutation in insulin receptor substrate–2 (Irs2) display a 17% increase in median life span. However, using the same mouse model, we find no evidence for life-span extension and suggest that the findings of Taguchi *et al*. were due to atypical life-span profiles in their study animals.

Full text at www.sciencemag.org/cgi/content/full/320/5879/1012b

Response to Comment on "Brain IRS2 Signaling Coordinates Life Span and Nutrient Homeostasis"

Akiko Taguchi and Morris F. White

Differences in reported life span of mice heterozygous for a null allele of the insulin receptor substrate–2 (Irs2) might involve the effects of diet, breeding strategies, and genetic background on insulin-like signaling cascades. A better understanding will emerge from studies focusing on the coordination of nutrient homeostasis and life span by insulin-like signaling in specific peripheral tissues and the central nervous system.

Full text at www.sciencemag.org/cgi/content/full/320/5879/1012c